

RING ELEMENT DYNAMIC STRESSES

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ABSTRACT

The stresses in the CTRAPRG and CTRIARG ring elements are not calculated for any of the dynamic solutions in the current COSMIC version of NASTRAN. This paper presents a DMAP alter sequence for Solution 8 and post-processing program, NASTPOST, to calculate these stresses. Test cases are presented which describe the method. The stiffness and the consistent versus concentrated mass problems which have been ascribed to this element are reviewed.

The DMAP alter sequence introduces Solution 8 displacements to a Solution 1 module to calculate Real and Imaginary stress components during the execution of Solution 8. The post-processor, NASTPOST, calculates the magnitude/phase stress results.

The DMAP sequence has been written specifically for Level 52 MSC/NASTRAN, but can certainly be used for any COSMIC version with slight modification.

INTRODUCTION

None of the currently documented versions of NASTRAN calculate the dynamic stresses in the CTRAPRG and CTRIARG solid of revolution elements. The stresses for these elements are calculated in NASTRAN for static solutions (e.g., Solution 1) but not in the dynamic solutions (e.g., Solution 8). Comments have been made by others which express the reasons for not including the stress calculations are related to the formulation of the mass matrix for the element.

Sample problems are given to show that the difference between the consistent and concentrated mass approach is greater than one might expect from arguments solely between the merits of consistent or concentrated mass.

This paper describes a DMAP alter sequence for Solution 8 and a post-processing program, NASTPOST, to calculate these dynamic stresses. The DMAP alter sequence introduces the displacements computed in Solution 8 to a Solution 1 module to calculate the complex stresses in the form of real and imaginary components. The post-processor, NASTPOST, calculates the stresses in the form of magnitude/phase.

DISCUSSION

It is not spelled out in the NASTRAN Users Manual that stresses for the solid of revolution elements are not calculated for dynamic solutions. Therefore, if one asks for stresses in a Solution 8 case control, the run is not aborted, but no stresses are obtained.

In order to perform noise path studies of an axisymmetric structure it became necessary to obtain these stresses. At first, the displacements for the entire structure, obtained from a Solution 8 forced vibration analysis were written into an output file; then these displacements, less one, were written into SPC format as enforced displacements for a Solution static analysis (this was done for the real and imaginary components separately). This technique was later modified, utilizing the DMAP alter sequence AOS8\$CS and a post-processor, NASTPOST.

The DMAP alter sequence is given in Figure 1. The major points are:

- The user can specify output requests as usual for SPCFORCES and DISPLACEMENTS.
- The user should specify STRESS (PUNCH) = ALL or a particular set ID if he wishes to subsequently use NASTPOST to calculate the magnitude/phase. This punched file will be sent to the users system space. (FOR 013.DAT for the MSC/NASTRAN VAX 11/780 VERSION).
- AOS8\$CS should be placed on the user's RFALTER library and executed then by calling RFAI = AOS8\$CS.

The program NASTPOST is given in the appendix and is used to calculate magnitude/phase stress components from real/imaginary stress components. The major points are:

- The components from FOR013.DAT above, are used as input to calculate the magnitude/phase stress components.
- This program can be run immediately after the execution of MSC/NASTRAN or at some later time.

The test problem for AOS8\$CS and NASTPOST is a circular plate fixed at the edges and driven by a single force, 100 dynes, at the center, normal to the plane of the plate. The finite element control model is the CQUAD2 and CTRIAG2 bending element model shown in Figure 2. The CTRAPRG model, shown in Figure 3, is formulated as a concentrated or consistent mass for each of the runs. The NASTRAN default value is the consistent mass matrix. The concentrated mass matrix is entered as CONM2 data. The three cases are compared in Table 1 for static, 2000 Hz and 8000 Hz at a position near the concentrated load and at the fixed edge.

The concentrated mass formulation gives good results, as compared to the control model. The consistent mass, or default formulation, gives results which do not agree with the control model at either the low, 2 kHz, or high, 8 kHz, forcing frequencies.

The static solution agrees very well with the control model which indicates that the stiffness of the model is represented correctly by solid of revolution elements. The error therefore is associated with the mass matrix formulation. The degree of error is obviously greater than one would expect from the normal arguments of consistent versus concentrated mass differences.¹

It can be argued that the use of cyclic symmetry with 3D elements rather than solid of revolution elements would have been a possible solution. This is certainly an avenue that deserves added investigation for comparison of cost and accuracy of solution compared to the solid of revolution elements with concentrated mass matrix.

CONCLUDING REMARKS

A DMAP alter sequence for Solution 8 and a post-processing program NASTPOST has been presented to calculate the dynamic stresses in CTRAPRG and CTRIARG solid of revolution ring finite elements. Users of this technique are cautioned to use the concentrated or lumped mass matrix rather than the consistent mass (default value) matrix.

The DMAP sequence has been written specifically for Level 52 MSC/NASTRAN, but can certainly be used for any COSMIC version with slight modification.

REFERENCES

1. Cook, R. D., "Concepts and Applications of Finite Element Analysis", John Wiley & Sons, Inc.

TABLE 1

COMPARISON OF STRESSES, 3/8 cm from CONCENTRATED LOAD

FREQUENCY	0 ¹	2 kHz	8 kHz
QUAD2	134.4	75.5	66.4
TRAPRG (CONS.)	132.3	17.2	63.1
TRARG (CONC.)	132.3	96.	60.5

TABLE 2

COMPARISON OF STRESSES, 3/8 cm from FIXED EDGE

FREQUENCY	0 ¹	2 kHz	8 kHz
QUAD2	44.4	34.2	38.2
TRAPRG (CONS.)	45.6	27.0	10.0
TRAPRG (CONC.)	45.6	33.0	36.0

¹ OBTAINED FROM SOLUTION 1

FIGURE 1 - ALTER AOS8\$CS

\$ BEGINNING OF ALTER AOS8\$CS
\$
\$ THIS ALTER PACKAGE IS USED TO CALCULATE
\$
\$ *DISPLACEMENTS (REAL/IMAGINARY) OR
\$ (MAGNITUDE/PHASE)
\$
\$ *SPCFORCES (REAL/IMAGINARY) OR
\$ (MAGNITUDE/PHASE)
\$
\$ *STRESSES (REAL/IMAGINARY)
\$
\$ FOR THE CTRAPRG AND CTRIARG RING ELEMENTS
\$
\$
\$ CASE CONTROL INPUT

FIGURE 1 - (Cont'd)

\$
\$ THE USER SHOULD SELECT THE DESIRED
\$ OUTPUT AS USUAL FOR DISPLACEMENTS
\$ AND SPCFORCES.
\$
\$ THE USER SHOULD SELECT THE PUNCH
\$ OPTION FOR STRESS IF IT IS DESIRED TO
\$ SUBSEQUENTLY CALCULATE (MAGNITUDE/
\$ PHASE) USING A POST-PROCESSING PROGRAM
\$
\$
\$
ALTER 166
OFP OPPC1,OQPC1,OUPVC1,,,//U,N,CARDNO \$
ALTER 185,186
PARAM //STSR/13/-64 \$
GP3 GEOM3,EQEXIN,GEOM2/,ETT/0/U,N,NOGRAV/0 \$

FIGURE 1 - (Cont'd)

PARAML UPVC//C,N,TRAILER/2/V,N,ROWS \$
MATGEN ,/UNIT/1/ROWS \$
MODTRL UPVC///3 \$
MPYAD UNIT,UPVC,/ASQR/ \$
DIAGONAL ASQR/ATRM// \$
ADD UPVC,/BSQR/(0.0,-1.0) \$
DIAGONAL BSQR/BTRM// \$
⑥ SDR2 CASECC,CSTM,MPT,DIT,EQEXIN,SIL,ETT,EDT,BGPDT,,,ATRM,EST,
XYCDB/,,,0ESCR,,,/STATICS/S,N,NOSORT2 \$
SDR2 CASECC,CSTM,MPT,DIT,EQEXIN,SIL,ETT,EDT,BGPDT,,,BTRM,EST,
XYCDB/,,,0ESCI,,,/STATICS/S,N,NOSORT2 \$
OFP ,,,0ESCR,,,/S,N,CARDNO \$
OFP ,,,0ESCI,,,/S,N,CARDNO \$
PARAM //STSR/7/-64 \$
ENDALTER \$
\$

FIGURE 2 - CQUAD2, CTRIAG FINITE ELEMENT MODEL OF 10.00 CM DIA., 1 CM THK PLATE

70

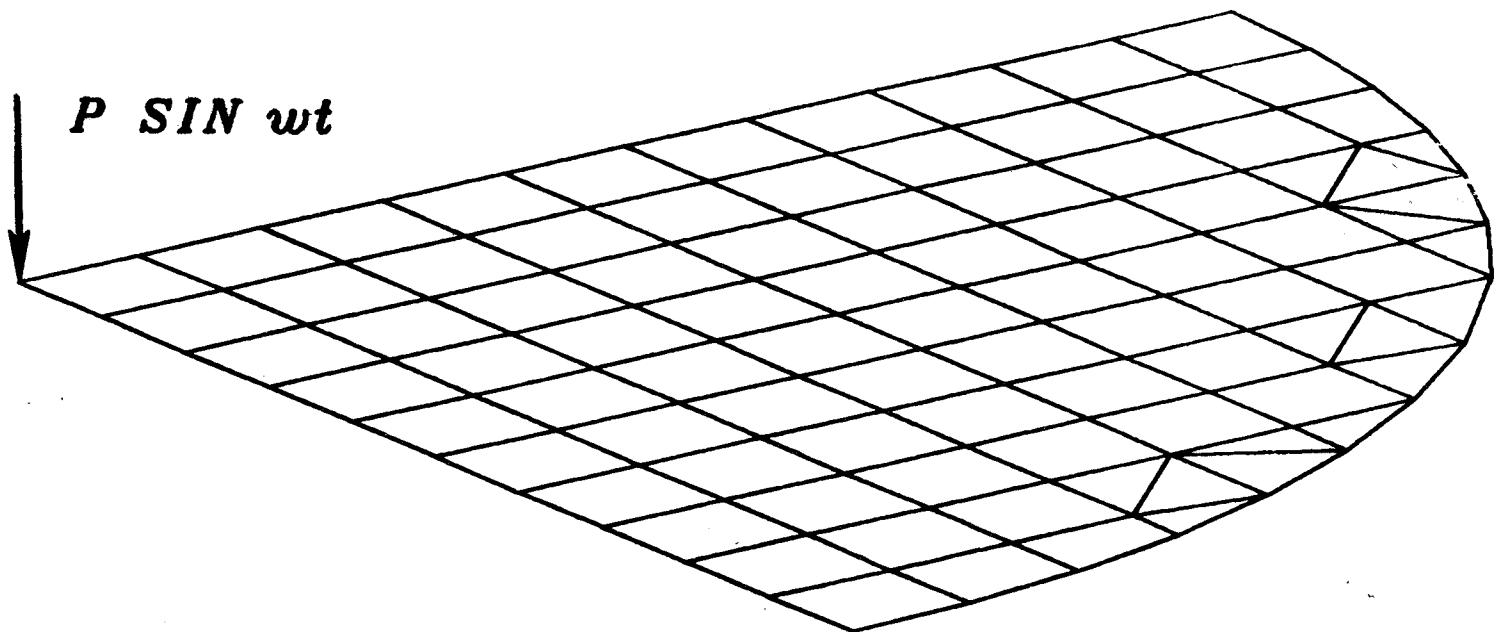
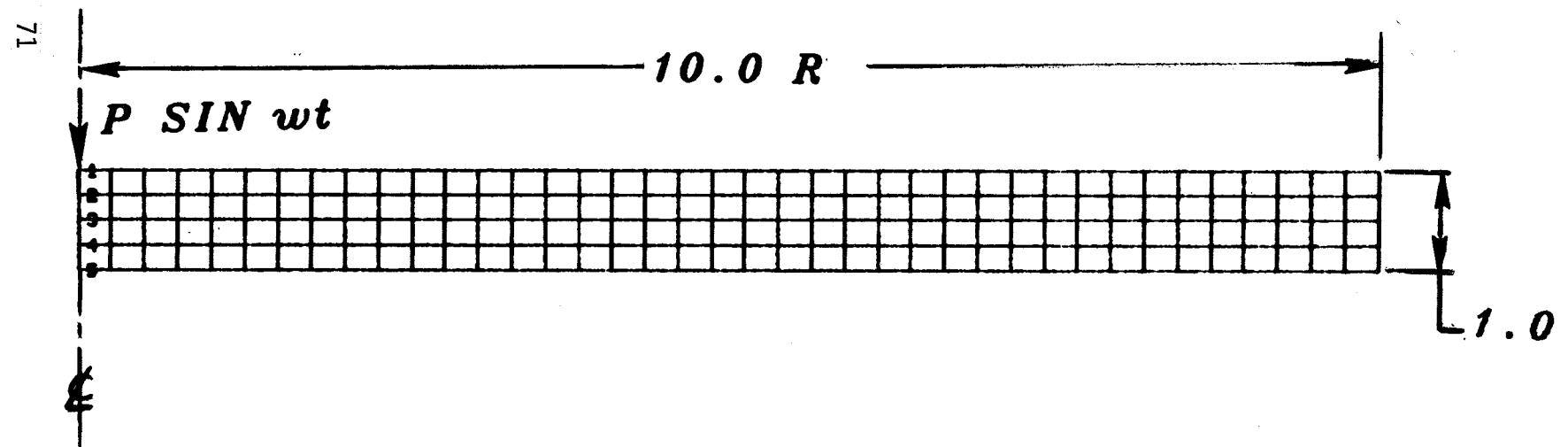


FIGURE 3 - CTRAPRG SOLID OF REVOLUTION FINITE ELEMENT MODEL



APPENDIX A

THE NASTPOST PROGRAM

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C      DATA SET NASTPOST   AT LEVEL 017 AS OF 11/05/79
COMMON /HDCR0M/TITLE(16),SUBT(16),LABEL(16)
DATA DTIT//STIT//,CASE//CASE//,DSUB//SSUB//,
*      DELE//SELE//,BSTR//STR//,DLAB//SLAB//
DATA I036,I037/280/
1 CONTINUE
REWIND ?
C - GET TITLE CARD
5 CONTINUE
READ(7,900,END=999) TEMP,TITLE
IF(TEMP.EQ.DTIT) GO TO 6
GO TO 5
C - GET SUBTITLE CARD
6 CONTINUE
READ(7,900,END=999) TEMP,SUBT
IF(TEMP.EQ.DSUB) GO TO 7
GO TO 6
C - GET LABEL CARD
7 CONTINUE
READ(7,900,END=999) TEMP,LABEL
IF(TEMP.EQ.DLAB) GO TO 10
GO TO 7
C - GET STRESS CARD
10 CONTINUE
READ(7,910,END=999) TEMP
IF(TEMP.EQ.BSTR) GO TO 20
GO TO 10
C - GET SUBCASE IDENTIFICATION
20 CONTINUE
READ(7,920,END=999) TEMP,ISID
IF(TEMP.EQ.CASE) GO TO 30
GO TO 20
C - GET ELEMENT TYPE
30 CONTINUE
READ(7,930,END=999) TEMP,IELTYP
IF(TEMP.NE.DELE) GO TO 5
C - CHECK ELEMENT TYPES
IF(IELTYP.EQ.36) GO TO 360
IF(IELTYP.EQ.37) GO TO 370
GO TO 5
C - ELEMENT TYPE = 36
360 CONTINUE
IF(I036.EQ.0) CALL RW36(ISID,IELTYP,IEOF)
IF(I036.EQ.1) CALL RC36(ISID,IELTYP,IEOF)
IF(I036.EQ.1.AND. IEOF.EQ.1) GO TO 999
I036 = MOD(I036+1,2)
GO TO 6
C - ELEMENT TYPE = 37
370 CONTINUE
IF(I037.EQ.0) CALL RW37(ISID,IELTYP,IEOF)
IF(I037.EQ.1) CALL RC37(ISID,IELTYP,IEOF)
IF(I037.EQ.1.AND. IEOF.EQ.1) GO TO 999
I037 = MOD(I037+1,2)
GO TO 6
999 STOP
900 FORMAT(A4,6X,15A4,A2)
910 FORMAT(8X,A4)
920 FORMAT(4X,A4,8X,I9)
930

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FORMAT(A4,12X,I11)          198 00059
END
C      DATA SET NASTR36  AT LEVEL 004 AS OF 11/02/79
SUBROUTINE RU36(ISID,IELTYP,IEOF)          00001
DIMENSION TEMP(2),DATA(4)          00002
DATA TITLE//ST //,CONT//'-CON//,BLANK//      00003
DATA INN,IOUT/7,9/          00004
REWIND IOUT          00005
PRINT 10
10     FORMAT('SUBROUTINE RU36')
READ(INN,900,END=999) IELNO,DATA(1),DATA(2),DATA(3)          00007
001     CONTINUE
READ(INN,910,END=999) CARDN,DATA(4)          00008
IF(CARDN .NE. CONT) GO TO 990          00009
WRITE(IOUT) ISID,IELTYP,IELNO,DATA          00010
C     READ(INN,920,END=999) TEMP          00011
C     BACKSPACE INN          00012
CALL BACKSP(TEMP,INN,6999)
IF(TEMP(1).EQ.BLANK)
3     READ(10,900,END=999)IELNO,DATA(1),DATA(2),DATA(3)          00013
IF(TEMP(1).EQ. BLANK) GO TO 001          00014
IF(TEMP(1) .NE. TITLE) GO TO 990          00015
000 CONTINUE          00016
ENDFILE IOUT          00017
REWIND IOUT          00018
RETURN
990 CONTINUE          00019
STOP 3600          00020
999 IEOF = 1          00021
GO TO 800          00022
900 FORMAT(10,8X,3E18.6)          00023
910 FORMAT(A4,14X,3E18.6)          00024
920 FORMAT(2A2)
END
C      DATA SET NASTR37  AT LEVEL 004 AS OF 11/02/79          00001
SUBROUTINE RU37(ISID,IELTYP,IEOF)          00001
10     FORMAT('SUBROUTINE RU37')
DIMENSION TEMP(2),DATA(20),KKREAD(33)          00003
DATA TITLE//ST //,CONT//'-CON//,BLANK//      00004
DATA INN,IOUT/7,8/          00005
REWIND IOUT
PRINT 10
READ(INN,900,END=999) IELNO,DATA(1),DATA(2),DATA(3)          00007
001     CONTINUE
READ(INN,910,END=999) CARDN,DATA(4),DATA(5),DATA(6)          00008
IF(CARDN .NE. CONT) GO TO 990          00009
READ(INN,910,END=999) CARDN,DATA(7),DATA(8),DATA(9)          00010
IF(CARDN .NE. CONT) GO TO 990          00011
READ(INN,910,END=999) CARDN,DATA(10),DATA(11),DATA(12)          00012
IF(CARDN .NE. CONT) GO TO 990          00013
READ(INN,910,END=999) CARDN,DATA(13),DATA(14),DATA(15)          00014
IF(CARDN .NE. CONT) GO TO 990          00015
READ(INN,910,END=999) CARDN,DATA(16),DATA(17),DATA(18)          00016
IF(CARDN .NE. CONT) GO TO 990          00017
READ(INN,910,END=999) CARDN,DATA(19),DATA(20)          00018
IF(CARDN .NE. CONT) GO TO 990          00019
WRITE(IOUT) ISID,IELTYP,IELNO,DATA          00020
READ(INN,920,END=999) TEMP          00021
BACKSPACE INN          00022
READ(INN,930,END=999)KKREAD
REWIND 10
WRITE(10,930)KKREAD
REWIND

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10  READ(10,920)TEMP
    REWIND 10
    IF(TEMP(1) .EQ. BLANK)
    8 READ(10,900,END=999)IELNO,DATA(1),DATA(2),DATA(3)
    IF(TEMP(1).EQ.BLANK) GOTO 001
    IF(TEMP(1) .NE. TITLE) GO TO 990
    800 CONTINUE
    ENDFILE IOUT
    REWIND IOUT
    RETURN
    990 CONTINUE
    STOP 3700
    999 IEOF = 1
    GO TO 800
    900 FORMAT(I10.8X,3E18.6)
    910 FORMAT(A4,14X,3E18.6)
    920 FORMAT(2A2)
    930 FORMAT(33A4)
    END
C      DATA SET NASTRC36  AT LEVEL 025 AS OF 11/05/79
    SUBROUTINE RC36(ISID,IELTYP,IEOF)
    10  FORMAT('SUBROUTINE RC36')
    DIMENSION TEMP(2),DATAI(4),DATAR(4),RMAG(4),PHASE(4)
    DATA TITLE/'ST //,CONT/-CON//,BLANK//'
    DATA IPRT,INN,IOUT/6,7,9/
    PRINT 10
    IELCNT = 99
    RADDEG = 57.29578
    READ(INN,900,END=999) IELNO,DATAI(1),DATAI(2),DATAI(3)
    CONTINUE
    READ(INN,910,END=999) CARDN,DATAI(4)
    IF(CARDN .NE. CONT) GO TO 990
    READ(IOUT) ISIDR,IELTPR,IELNOR,DATA
    IF(ISIDR .NE. ISID) GO TO 990
    IF(IELTPR .NE. IELTYP) GO TO 990
    IF(IELNOR .NE. IELNO) GO TO 990
    DO 699 I = 1,4
    RMAG(I) = SORT(DATAR(I)*DATAR(I) + DATAI(I)*DATAI(I))
    IF(DATAR(I) .NE. 0.0) GO TO 699
    IF(DATAI(I) .EQ. 0.0) PHASE(I) = 0.0
    IF(DATAI(I) .GT. 0.0) PHASE(I) = 90.0
    IF(DATAI(I) .LT. 0.0) PHASE(I) = 270.0
    GO TO 699
    699 CONTINUE
    RATIO = ABS(DATAI(I)/DATAR(I))
    PHASE(I) = ATAN(RATIO)*RADDEG
    IF(DATAI(I) .GE. 0.0 .AND. DATAR(I).LT.0.0)
    X PHASE(I) = PHASE(I) + 90.0
    X IF(DATAI(I).LT.0.0 .AND. DATAR(I).LT.0.0)
    X PHASE(I) = PHASE(I) + 180.0
    X IF(DATAI(I).LT.0.0 .AND. DATAR(I).GT.0.0)
    X PHASE(I) = PHASE(I) + 270.0
    C 699 CONTINUE
    WRITE(IPRT,930) ISID,IELTYP,IELNO,DATA,DATAI
    IF(IELCNT .LT. 50) GO TO 700
    CALL HB36(ISID)
    IELCNT = 0
    700 CONTINUE
    IELCNT = IELCNT + 1

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00037
C   WRITE(IPRT,940) IELNO,((RMAG(I),PHASE(I)),I=1,4)      00038
C   READ(INN,920,END=999) TEMP                         00039
C   BACKSPACE INN
C   CALL BACKSP(TEMP,INN,999)
C   IF(TEMP(1).EQ.BLANK)
8   READ(1,900,END=999)IELNO,DATA1(1),DATA1(2),DATA1(3) 00040
C   IF(TEMP(1) .EQ. BLANK) GO TO 991
C   IF(TEMP(1) .NE. TITLE) GO TO 990
C   RETURN
990 CONTINUE
C   STOP 3601
999 IEOF = 1
C   RETURN
900 FORMAT(I10,8X,3E18.6)                                00041
910 FORMAT(A4,14X,3E18.6)                                00042
920 FORMAT(2A2)                                         00043
930 FORMAT(1X,3I10,2(/,4I5X,1PE12.5)))                 00044
940 FORMAT(1X,15,8X,4(1PE12.5,' ',0PF10.5,5X))        00045
C   END
C   DATA SET NASTRC37 AT LEVEL 022 AS OF 11/05/79      00046
C   SUBROUTINE RC37(ISID,IELTYP,IEOF)                   00047
10  FORMAT('SUBROUTINE RC37')
DIMENSION TEMP(2),DATA1(20),DATAR(20),RMAG(20),PHASE(20) 00048
DATA TITLE/'ST  ','CONT','COM','BLANK',' '
DATA IPRT,INN,IOUT/6,7,8/                                00049
      PRINT 10
IELCNT = 10
RADDEG = 57.29578
READ(INN,900,END=999) IELNO,DATA1(1),DATA1(2),DATA1(3) 00050
001  CONTINUE
READ(INN,910,END=990) CARDN,DATA1(4),DATA1(5),DATA1(6) 00051
IF(CARDN .NE. CONT) GO TO 990
READ(INN,910,END=990) CARDN,DATA1(7),DATA1(8),DATA1(9) 00052
IF(CARDN .NE. CONT) GO TO 990
READ(INN,910,END=990) CARDN,DATA1(10),DATA1(11),DATA1(12) 00053
IF(CARDN .NE. CONT) GO TO 990
READ(INN,910,END=990) CARDN,DATA1(13),DATA1(14),DATA1(15) 00054
IF(CARDN .NE. CONT) GO TO 990
READ(INN,910,END=990) CARDN,DATA1(16),DATA1(17),DATA1(18) 00055
IF(CARDN .NE. CONT) GO TO 990
READ(INN,910,END=990) CARDN,DATA1(19),DATA1(20)        00056
IF(CARDN .NE. CONT) GO TO 990
READ(IOUT) ISIDR,IELTPR,IELNOR,DATAR
IF(ISID .NE. ISIDR) GO TO 990
IF(IELTYP .NE. IELTPR) GO TO 990
IF(IELNOR .NE. IELNO) GO TO 990
DO 699 I = 1,20
      RMAG(I) = SORT(DATAR(I)*DATAR(I) + DATA1(I)*DATA1(I))
      IF(DATAR(I) .NE. 0.0) GO TO 690
      IF(DATA1(I) .EQ. 0.0) PHASE(I) = 0.0
      IF(DATA1(I) .GT. 0.0) PHASE(I) = 90.0
      IF(DATA1(I) .LT. 0.0) PHASE(I) = 270.0
      GO TO 690
690  CONTINUE
      RATIO = ABS(DATA1(I)/DATAR(I))
      PHASE(I) = ATAN(RATIO)*RADDEG
      IF(DATA1(I).GE.0.0 .AND. DATAR(I).LT.0.0) 00057
      X   PHASE(I) = PHASE(I) + 90.0
      IF(DATA1(I).LT.0.0 .AND. DATAR(I).LT.0.0) 00058

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      X  PHASE(I) = PHASE(I) + 180.0          00038
      X  IF(DATA1(I).LT.0.0 .AND. DATA1(I).GT.0.0) 00039
      X  PHASE(I) = PHASE(I) + 270.0          00040
  699 CONTINUE          00041
C   WRITE(IPRT,930) ISID,IELTYP,IELNO,DATA1,DATAI 00042
  IF(IELCNT .LE. 7) GO TO 700          00043
  CALL HD37(ISID)          00044
  IELCNT = 0          00045
  700 CONTINUE          00046
  IELCNT = IELCNT + 1          00047
  DO 710 I = 1,5          00048
    J = 4*(I-1) + 1          00049
    K = J + 3          00050
    IF(I .EQ. 1) WRITE(IPRT,940) IELNO,I,          00051
    X  ((RMAG(IX1),PHASE(IX1)),IX1=J,K)          00052
    IF(I .NE. 1) WRITE(IPRT,950) I,          00053
    X  ((RMAG(IX1),PHASE(IX1)),IX1=J,K)          00054
  710 CONTINUE          00055
  WRITE(IPRT,960)          00056
C   READ(INN,920,END=999) TEMP          00057
C   BACKSPACE INN          00058
  CALL BACKSP(TEMP,INN,999)
  IF(TEMP(1).EQ.BLANK)
  S  READ(10,900,END=999) IELNO,DATA1(1),DATA1(2),DATA1(3) 00059
  IF(TEMP(1) .EQ. BLANK) GO TO 901          00060
  IF(TEMP(1) .NE. TITLE) GO TO 990          00061
  RETURN          00062
  990 CONTINUE          00063
  STOP 3701          00064
  999 IEOF = 1          00065
  RETURN          00066
  900 FORMAT(I10,8X,3E18.6)          00067
  910 FORMAT(A4,14X,3E18.6)          00068
  920 FORMAT(2A2)          00069
  930 FORMAT(1X,3I10,10(/,4(5X,1PE13.6)))          00070
  940 FORMAT(1X,15,1X,I3,4X,4(1PE12.5,' ',0PF10.5,5X)) 00071
  950 FORMAT(7X,I3,4X,4(1PE12.5,' ',0PF10.5,5X)) 00072
  960 FORMAT(' ')
  END          00073
C   DATA SET NASTHD36  AT LEVEL 007 AS OF 10/24/79          00001
  SUBROUTINE HD36(ISID)
  10  FORMAT('SUBROUTINE HD36')
  COMMON /HDCOM/TITLE(16),SUBT(16),LABEL(16)          00002
  PRINT 10          00003
  IPRT = 6          00004
  WRITE(IPRT,100) TITLE          00005
  WRITE(IPRT,110) SUBT          00006
  WRITE(IPRT,120) LABEL,ISID          00007
  WRITE(IPRT,140)          00008
  WRITE(IPRT,150)          00009
  WRITE(IPRT,160)          00010
  WRITE(IPRT,170)          00011
  RETURN          00012
  100 FORMAT('1',3X,15A4,A8)          00013
  110 FORMAT(' ',3X,15A4,A8)          00014
  120 FORMAT('0',3X,15A4,A8,50X,'SUBCASE',I3)          00015
  130 FORMAT(' ')
  140 FORMAT(27X,'STRESSES FOR THE TRIAN',          00016

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      X      'GULAR RINGS ( CTRIARG )'
150 FORMAT(61X,'(MAGNITUDE/PHASE)')
160 FORMAT(4X,'EL',17X,'RADIAL',19X,'CIRCUMFERENTIAL',
      X 19X,'AXIAL',24X,'SHEAR')
170 FORMAT(4X,'ID',19X,'(X)',24X,'(THETA)',24X,'(Z)',
      X 26X,'(ZX)')
      END
C      DATA SET NASTHD37  AT LEVEL 006 AS OF 10/24/79
      SUBROUTINE HD37(ISID)                                00017
10      FORMAT('SUBROUTINE HD37')
      COMMON /HDRCOM/TITLE(16),SUBT(16),LABEL(16)          00018
      PRINT 10
      IPRT = 6                                              00019
      WRITE(IPRT,100) TITLE                                00020
      WRITE(IPRT,110) SUBT                                00021
      WRITE(IPRT,120) LABEL,ISID                          00022
      WRITE(IPRT,140)
      WRITE(IPRT,150)
      WRITE(IPRT,160)
      WRITE(IPRT,170)
      RETURN
100 FORMAT('1',3X,15A4,A2)                                00023
110 FORMAT(' ',3X,15A4,A2)
120 FORMAT('0',3X,15A4,A2,50X,'SUBCASE',I3)          00001
130 FORMAT(' ')
140 FORMAT(27X,'STRESSES FOR THE TRAPE',
      X '20 IDAL RINGS ( CTRAPRG )')
150 FORMAT(61X,'(MAGNITUDE/PHASE)')
160 FORMAT(4X,'EL',2X,'ST',13X,'RADIAL',19X,'CIRCUMFERENTIAL',
      X 19X,'AXIAL',24X,'SHEAR')
170 FORMAT(4X,'ID',2X,'PT',15X,'(X)',24X,'(THETA)',24X,'(Z)',
      X 26X,'(ZX)')
      END
      SUBROUTINE BACKSP(TEMP,INN,*)
      DIMENSION KKREAD(33),TEMP(2)
      READ(INN,930,END=999)KKREAD
      REWIND 10
      WRITE(10,930)KKREAD
      REWIND 10
      READ(10,920)TEMP
      REWIND 10
      930  FORMAT(33A4)
      930  FORMAT(2A2)
      RETURN
      999  RETURN 1
      END
      S

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